

Topic: Short term solar/atmospheric variability and climate

Project Title:

Observed Atmospheric Responses to Short-Term Solar UV Variations

PI Name: Lon L. Hood

PI Email: lon@lpl.arizona.edu

Affiliation: University of Arizona, Tucson

Collaborator(s):

- Boris Soukharev (University of Arizona)

Project Information:

OBJECTIVES: The primary objective is to more completely determine the observed solar-induced change in stratospheric and upper tropospheric temperature, ozone, and circulation on active region and solar rotational time scales as a function of altitude, latitude, season, and QBO phase. The overall goal of the research is to follow how the initial solar-induced response in the upper stratosphere propagates downward to the Earth's surface, as needed to understand solar-induced climate change on longer time scales.

METHODS/TECHNIQUES: We propose a series of new correlative, linear regression, and cross-spectral analyses to better determine and characterize the response of the stratosphere and upper troposphere to short-term (

SIGNIFICANCE/RELEVANCE: Short-term solar ultraviolet variations are a consequence of the production of magnetically active regions on the solar disk. A major forcing frequency corresponds to the 27-day solar rotation period, due to a tendency for the largest active regions to be on one side of the Sun. They penetrate into the upper stratosphere at low latitudes, modifying the concentration of stratospheric ozone, changing the latitudinal gradient of radiative heating, and perturbing the zonal wind at subtropical latitudes. On longer time scales, this solar forcing component is the main initiator of the proposed "top-down" mechanism for solar-induced climate change. The results of the work will help to identify primary dynamical mechanisms by which the solar-induced signal propagates into the lower stratosphere and troposphere; they will also help to validate general circulation and chemistry climate models, which can then be more confidently applied on longer time scales. The work directly addresses the observational part of Focused Science Topic (a) Short term solar/atmospheric variability and climate, as described in Appendix B.6 (Heliophysics Living With a Star Science) in the ROSES 2013 NRA.

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Duration:

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Program Element: Focused Science Topic

Citations: